

What is claimed is:

- 1        1. A method of cleaning a semiconductor device comprising the  
2 steps of :
  - 3            (i) mixing HF and ozone water in a vessel to form a solution of HF  
4 and ozone water; and
  - 5            (ii) dipping a semiconductor device in the vessel containing the  
6 solution of HF and ozone water,  
7                wherein the solution comprises about 0.034 to about 0.077 wt%  
8 HF.
- 1        2. The method of claim 1, wherein the solution of HF and ozone  
2 water comprises about 0.035 to about 0.075 wt% HF.
- 1        3. The method of claim 1, wherein the ozone water comprises  
2 about 5 to about 150 ppm ozone.
- 1        4. The method of claim 3, wherein the ozone water comprises  
2 about 15 to about 30 ppm ozone.
- 1        5. The method of claim 1, wherein in step (ii) the semiconductor  
2 device is dipped for a period between about 1 and about 30 minutes.
- 1        6. The method of claim 5, wherein the semiconductor device is  
2 dipped for a period of about 15 minutes.
- 1        7. The method of claim 1, whereby damaged layers and polymer  
2 residue are removed from the semiconductor device.

1           8. A method of cleaning a semiconductor device comprising the  
2 steps of :

3           (i) mixing HF and ozone water in a vessel to form a solution of HF  
4 and ozone water;

5           (ii) dipping a semiconductor device in the vessel containing the  
6 solution of HF and ozone water, and thereafter

7           (iii) introducing ozone water into the vessel to replace the solution of  
8 HF and ozone water in the vessel,

9           wherein the solution comprises about 0.034 to about 0.077 wt%

10 HF.

1           9. The method of claim 8, wherein the solution of HF and ozone  
2 water comprises about 0.035 to about 0.075 wt% HF.

1           10. The method of claim 8, wherein the ozone water comprises  
2 about 5 to about 150 ppm ozone.

1           11. The method of claim 10, wherein the ozone water comprises  
2 about 15 to about 30 ppm ozone.

1           12. The method of claim 8, wherein in step (ii) the semiconductor  
2 device is dipped for a period between about 1 and about 30 minutes.

1           13. The method of claim 12, wherein the semiconductor device is  
2 dipped for a period of about 15 minutes.

1           14. The method of claim 8, wherein in step (iii) ozone water is  
2 flowed into the vessel thereby causing an overflow of the solution of HF and  
3 ozone water out of the vessel.

1        15. The method of claim 14, wherein the ozone water is flowed into  
2 the vessel thereby causing the overflow of the solution of HF and ozone  
3 water out of the vessel for a period between about 1 and about 30 minutes.

1        16. The method of claim 15, wherein the period is about 20 minutes.

1        17. The method of claim 8, whereby damaged layers and polymer  
2 residue are removed from the semiconductor device.

1        18. A method of cleaning a semiconductor device comprising the  
2 steps of :

- 3        (i) introducing HF and ozone water into a vessel to form a solution  
4 of HF and ozone water;
- 5        (ii) mixing the HF and ozone water in the vessel to form a uniform  
6 solution of HF and ozone water; and
- 7        (iii) dipping a semiconductor device in the vessel containing the  
8 uniform solution of HF and ozone water.

1        19. The method of claim 18, wherein the solution comprises about  
2 0.034 to about 0.077 wt% HF.

1        20. The method of claim 19, wherein the solution of HF and ozone  
2 water comprises about 0.035 to about 0.075 wt% HF.

1        21. The method of claim 18, wherein the ozone water comprises  
2 about 5 to about 150 ppm ozone.

1        22. The method of claim 21, wherein the ozone water comprises  
2 about 15 to about 30 ppm ozone.

1        23. The method of claim 18, wherein in step (iii) the semiconductor  
2 device is dipped for a period between about 1 and about 30 minutes.

1           24. The method of claim 23, wherein the semiconductor device is  
2           dipped for a period of about 15 minutes.

1           25. The method of claim 18, wherein in step (ii) the HF and ozone  
2           water are mixed to form a uniform solution by circulation.

1           26. The method of claim 25, wherein the HF and ozone water are  
2           circulated by a pump.

1           27. The method of claim 26, wherein the HF and ozone water are  
2           circulated by flowing the HF and ozone water from an inner bath to an outer  
3           bath and pumped back into the inner bath.

1           28. The method of claim 18, whereby damaged layers and polymer  
2           residue are removed from the semiconductor device.

1           29. A method of cleaning a semiconductor device comprising the  
2           steps of:

3           (i) introducing HF and ozone water into a vessel to form a solution  
4           of HF and ozone water;

5           (ii) mixing the HF and ozone water in the vessel to form a uniform  
6           solution of HF and ozone water;

7           (iii) dipping a semiconductor device in the vessel containing the  
8           uniform solution of HF and ozone water; and

9           (iv) introducing ozone water into the vessel to replace the solution of  
10          HF and ozone water in the vessel.

1           30. The method of claim 29, wherein the solution comprises about  
2           0.034 to about 0.077 wt% HF.

1           31. The method of claim 30, wherein the solution of HF and ozone  
2           water comprises about 0.035 to about 0.075 wt% HF.

1           32. The method of claim 29, wherein the ozone water comprises  
2           about 5 to about 150 ppm ozone.

1           33. The method of claim 32, wherein the ozone water comprises  
2           about 15 to about 30 ppm ozone.

1           34       The method of claim 29, wherein in step (iii) the semiconductor  
2           device is dipped for a period between about 1 and about 30 minutes.

1           35.      The method of claim 34, wherein the semiconductor device is  
2           dipped for a period of about 15 minutes.

1           36.      The method of claim 29, wherein in step (iv) ozone water is  
2           flowed into the vessel thereby causing an overflow of the solution of HF and  
3           ozone water out of the vessel.

1           37.      The method of claim 36, wherein the ozone water is flowed into  
2           the vessel thereby causing the overflow of the solution of HF and ozone  
3           water out of the vessel for a period between about 1 and about 30 minutes.

1           38.      The method of claim 37, wherein the period is about 20 minutes.

1           39.      The method of claim 29, wherein in step (ii) the HF and ozone  
2           water are mixed to form a uniform solution by circulation.

1           40.      The method of claim 39, wherein the HF and ozone water are  
2           circulated by a pump.

1           41.      The method of claim 40, wherein the HF and ozone water are  
2           circulated by flowing the HF and ozone water from an inner bath to an outer  
3           bath and pumped back into the inner bath.

1                   42. The method of claim 29, whereby damaged layers and polymer  
2 residue are removed from the semiconductor device.

the *Journal of the Royal Society of Medicine* (1957, 50, 100-101) and the *Journal of Clinical Pathology* (1957, 11, 211-212).